UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: ALL YEAR 1 PROGRAMMES (AGRICULTURE & CONSUMER SCIENCES)

COURSE CODE: ABE102

TITLE OF PAPER: PHYSICS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

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SECTION 1: COMPULSORY QUESTION

QUESTION 1

a.   Given that the velocity v of a liquid leaving a nozzle depends upon a pressure drop p and the density ρ. Using dimensional analysis, show that a relationship between v, p, and ρ can be established.   **[15 marks]**

b.   A 3 cm cube of metal is suspended by a thread attached to a scale. The cube appears to have a mass of 47.3 g when measured submerged in water. What will its mass be when submerged in glycerine of a specific gravity of 1.26?   **[15 marks]**

c.   How much heat is required to raise the temperature of 0.2 kg of aluminium from 18 °C to 65 °C, assume the specific heat capacity of aluminium to be 950 J/kg°C.   **[10 marks]**

SECTION II: ANSWER ANY TWO (2) QUESTIONS

QUESTION 2

a.   Joe is driving his motorcycle along a straight road at a uniform velocity of 25 m/s when he suddenly sees a cow in the road directly in front of him at a distance of 110 m. It takes 0.7 s for his hand to squeeze the brake lever (the reaction time) and then his cycle slows down at -4 m/s^2.

   (i)   How far does he travel in coming to a stop (from the point where he first sees the cow)?   **[10 marks]**

   (ii)   What should his reaction time be if he wanted to stop in a distance of exactly 110 m?   **[10 marks]**

   b.   State the principle of conservation of energy and explain how this principle is applied when a ball is thrown vertically upwards.   **[10 marks]**

QUESTION 3

a.   Write the expressions/or equations for determining the following:

   (i)   Density   **[3 marks]**

   (ii)   Specific weight/density   **[3 marks]**

   (iii)   Specific gravity   **[4 marks]**

b.   A 50 kg block rests on a sloping board and when the board is raised to make an angle of 30° to the horizontal the block begins to slide. Calculate:

   (i)   The coefficient of static friction between the block and the board.   **[10 marks]**

   (ii)   The amount of force necessary to move the block up the board at a uniform velocity. Assume the dynamic coefficient is 80% of the coefficient of static friction. **[10 marks]**

QUESTION 4

a.   Two resistors of 6Ω and 10Ω are connected in series with a battery of 30 V as shown in the Figure.
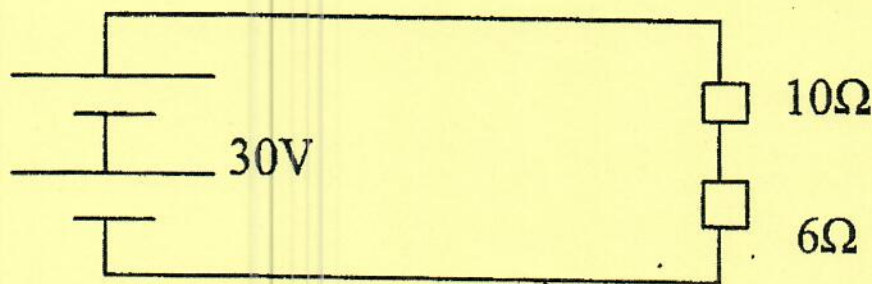
Calculate:

   (i)   The current passing through the circuit   **[5 marks]**

   (ii)   Potential difference across each resistor   **[5 marks]**

   (iii)   Power dissipated by each resistor   **[5 marks]**

   (iv)   Total energy consumed in a 4-hour operation   **[5 marks]**

b.   Write the three (3) fundamental equations of linear motion   **[10 marks]**